0064628

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

05-AMRC-0220

APR 19 2005

Mr. Nicholas Ceto, Project Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
309 Bradley Boulevard, Suite 115
Richland, Washington 99352

Dear Mr. Ceto:

TRANSMITTAL OF WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DRAFT A DOCUMENTATION FOR THE 100-F-26:7 SITE

Attached for your review are Waste Site Reclassification Form (WSRF) No. 2005-010, and supporting *Remaining Sites Verification Package for the 100-F-26:7 Sodium Dichromate and Sodium Silicate Pipelines.* If you have any questions regarding this document, please contact Chris Smith, of my staff, at (509) 372-1544.

Sincerely,

Leif Erickson, Assistant Manager
for the River Corridor

AMRC:DCS

Enclosure

cc w/encl:
Administrative Record

cc w/o encl:
R. A. Carlson, BHI
L. M. Dittmer, BHI
L. E. Gadbois, EPA

Waste Site Reclassification Form

Date Submitted: 4/7/05 Originator: R. A. Carlson Phone: 373-9759	Operable Unit(s): 100-FR-1 Waste Site ID: 100-F-26:7 Type of Reclassification Action: Rejected ☐ Closed Out ☐ Interim Closed Out ☒ No Action ☐	Control Number: 2005-010 Lead Agency: EPA

This form documents agreement among the parties listed below authorizing classification of the subject unit as rejected, closed out, interim closed out, or no action and authorizing backfill of the site, if appropriate. Final removal from the National Priorities List of no action, interim closed out, or closed-out sites will occur at a future date.

Description of current waste site condition:
The 100-F-26:7, Sodium Dichromate and Sodium Silicate Pipelines, subsite is located within the 100-FR-1 Operable Unit of the Hanford Site and is 1 of 16 subsites associated with the 100-F-26 underground pipelines. The 100-F-26:7 subsite consists of two parallel, 0.07m (3-inch) steel pipelines that conveyed water treatment chemicals from the 108-F building to the 183-F water treatment facilities. Sampling and evaluation of this site have been performed in accordance with remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington. The selected action involved (1) sampling the site, (2) remediating the site, (3) demonstrating through verification sampling that cleanup goals have been met, and (4) proposal for interim closed out.

Basis for reclassification:

The 100-F-26:7, Sodium Dichromate and Sodium Silicate Pipelines meets the remedial action objectives specified in the Remaining Sites ROD. The results demonstrated that residual contaminant concentrations support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. These results also showed that residual concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. As defined in the *100 Area Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL 96-17, Rev. 5) this subsite does not have a deep zone; therefore, no deep zone institutional controls are required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for 100-F-26:7, Sodium Dichromate and Sodium Silicate Pipelines* (attached).

D. C. Smith DOE-RL Project Manager	Signature	Date
N/A Ecology Project Manager	Signature	Date
L. E. Gadbois EPA Project Manager	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR 100-F-26:7 SODIUM DICHROMATE AND SODIUM SILICATE PIPELINES

Attachment to Waste Site Reclassification Form 2005-010

March 2005

REMAINING SITES VERIFICATION PACKAGE FOR 100-F-26:7 SODIUM DICHROMATE AND SODIUM SILICATE PIPELINES

EXECUTIVE SUMMARY

The 100-F-26 site includes the underground process and sanitary sewer pipelines associated with the 100-F Area pre-reactor cooling water treatment facilities. For the confirmatory sampling effort, the 100-F-26 site has been divided into 16 subsites based on intended use of the pipe (i.e., sanitary sewer or process water), expected sources of contamination, and potential remedial actions. The 100-F-26:7 waste site consists of a subset of pipelines associated with the 100-F-26 waste site and is the only subsite discussed in this report. The 100-F-26:7 waste site is a pair of 7.6-cm (3-in.) steel pipelines that conveyed sodium dichromate and sodium silicate, respectively, from the 108-F Chemical Pumping Building to the 190-F Water Treatment Building.

Based on historical information, the sodium silicate pipeline conveyed only chemicals with low inherent toxicity or that readily degrade to compounds of low inherent toxicity, and therefore is not considered hazardous/dangerous or to present a risk to human health or the environment. However, because the sodium silicate pipeline is within 0.8 m (2 ft) of the sodium dichromate pipeline along their entire lengths, the two are treated as twin pipelines for confirmatory sampling purposes. The sodium dichromate pipeline was the only pipeline of the pair from which samples were taken and analyzed.

A focused sampling approach was selected for this site, biased toward worst-case sample locations and locations that were accessible (BHI 2004b). Results of the sampling event were used to make decisions for reclassifying the site in accordance with the TPA-MP-14 process (DOE-RL 1998).

Confirmatory sampling was conducted at the 100-F-26:7 subsite in January 2005. One sample and one duplicate sample were collected of soil beneath the sodium dichromate pipeline. An additional sample of the sodium dichromate pipeline was taken for analysis. Based on laboratory preparation for this pipeline material, results from its analysis are treated as pipeline sediment/scale. The maximum detected results from the soil and pipe sediment/scale were used to support waste site reclassification. A summary of the evaluation of the sample results against the applicable remedial action goals is presented in Table ES-1.

In accordance with this evaluation, the confirmatory sampling results support a reclassification of this site to interim closed out. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required.

Table ES-1. Summary of Remedial Action Goals for the 100-F-26:7 Site.

Regulatory Requirement	Remedial Action Goals[a]	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15-mrem/yr dose rate above background over 1,000 years.	There are no radionuclide COPCs for this site.	Not applicable
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	All hazard quotients are less than 1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient (4.9×10^{-3}) is less than 1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk (4×10^{-7}) for carcinogens is less than 1×10^{-6}.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk (4×10^{-7}) is less than 1×10^{-5}.	
Groundwater/River Protection – Radionuclides	Attain single-COPC groundwater and river protection RAGs.	There are no radionuclide COPCs for this site.	Not applicable
	Attain national primary drinking water standards[b]: 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.		
	Meet drinking water standards for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5.[c]		
	Meet total uranium standard of 30 µg/L (21.2 pCi/L)[d].		
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Maximum detected results for all compounds are below groundwater and river protection RAGs.	Yes

[a] *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b).

[b] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).

[c] *Radiation Protection of the Public and the Environment* (DOE Order 5400.5).

[d] Based on the isotopic distribution of uranium in the 100 Areas, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).

COPC = contaminant of potential concern
MCL = maximum contaminant level
RAG = remedial action goal

REMAINING SITES VERIFICATION PACKAGE FOR 100-F-26:7 SODIUM DICHROMATE AND SODIUM SILICATE PIPELINES

STATEMENT OF PROTECTIVENESS

This report demonstrates that the 100-F-26:7 Sodium Dichromate and Sodium Silicate Pipelines site meets the objectives for interim closure as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (commonly referred to as the Remaining Sites Record of Decision [ROD]) (EPA 1999). These results show that residual concentrations associated with the pipe and surrounding soil support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-F-26 site includes the underground process and sanitary sewer pipelines associated with the 100-F Area pre-reactor cooling water treatment facilities. For the confirmatory sampling effort, the 100-F-26 site has been divided into 16 subsites based on intended use of the pipe (i.e., sanitary sewer or process water sewer), expected sources of contamination, and potential remedial actions. The 16 subsites are as follows:

- 100-F-26:1 North process sewer collection pipelines
- 100-F-26:2 Process water pipelines to the aquatic biology and strontium gardens
- 100-F-26:3 184-F Powerhouse pipelines
- 100-F-26:4 South process pipelines
- 100-F-26:5 190-F bypass pipelines
- 100-F-26:6 190-F Reservoir pipelines
- 100-F-26:7 Sodium dichromate and sodium silicate pipelines
- 100-F-26:8 1607-F1 sanitary sewer pipelines
- 100-F-26:9 1607-F2 sanitary sewer pipelines
- 100-F-26:10 1607-F3 sanitary sewer pipelines
- 100-F-26:11 1607-F4 sanitary sewer pipelines
- 100-F-26:12 1.8-m (72-in.) main process sewer pipeline
- 100-F-26:13 108-F drain pipelines
- 100-F-26:14 116-F-5 influent pipelines
- 100-F-26:15 Miscellaneous pipelines associated with the 1608-F sump
- 100-F-26:16 Reactor cooling water pipelines.

The 100-F-26:7 waste site consists of a subset of pipelines associated with the 100-F-26 underground pipelines waste site and is the only subsite discussed in this report; the other subsites will be addressed in separate reports. The 100-F-26:7 waste site is a pair of 7.6-cm (3-in.) steel pipelines that conveyed sodium dichromate and sodium silicate, respectively, from the 108-F Chemical Pumping Building to the 190-F Water Treatment Building (Figure 1).

Based on historical information, the sodium silicate pipeline conveyed only chemicals with low inherent toxicity or that readily degrade to compounds of low inherent toxicity, and therefore is not considered hazardous/dangerous or to present a risk to human health or the environment. However, because the sodium silicate pipeline is within 0.8 m (2 ft) of the sodium dichromate pipeline along their entire lengths, the two are treated as twin pipelines for confirmatory sampling purposes. The sodium dichromate pipeline was the only pipeline of the pair from which samples were taken and analyzed.

CONFIRMATORY SAMPLING ACTIVITIES

Contaminants of Potential Concern

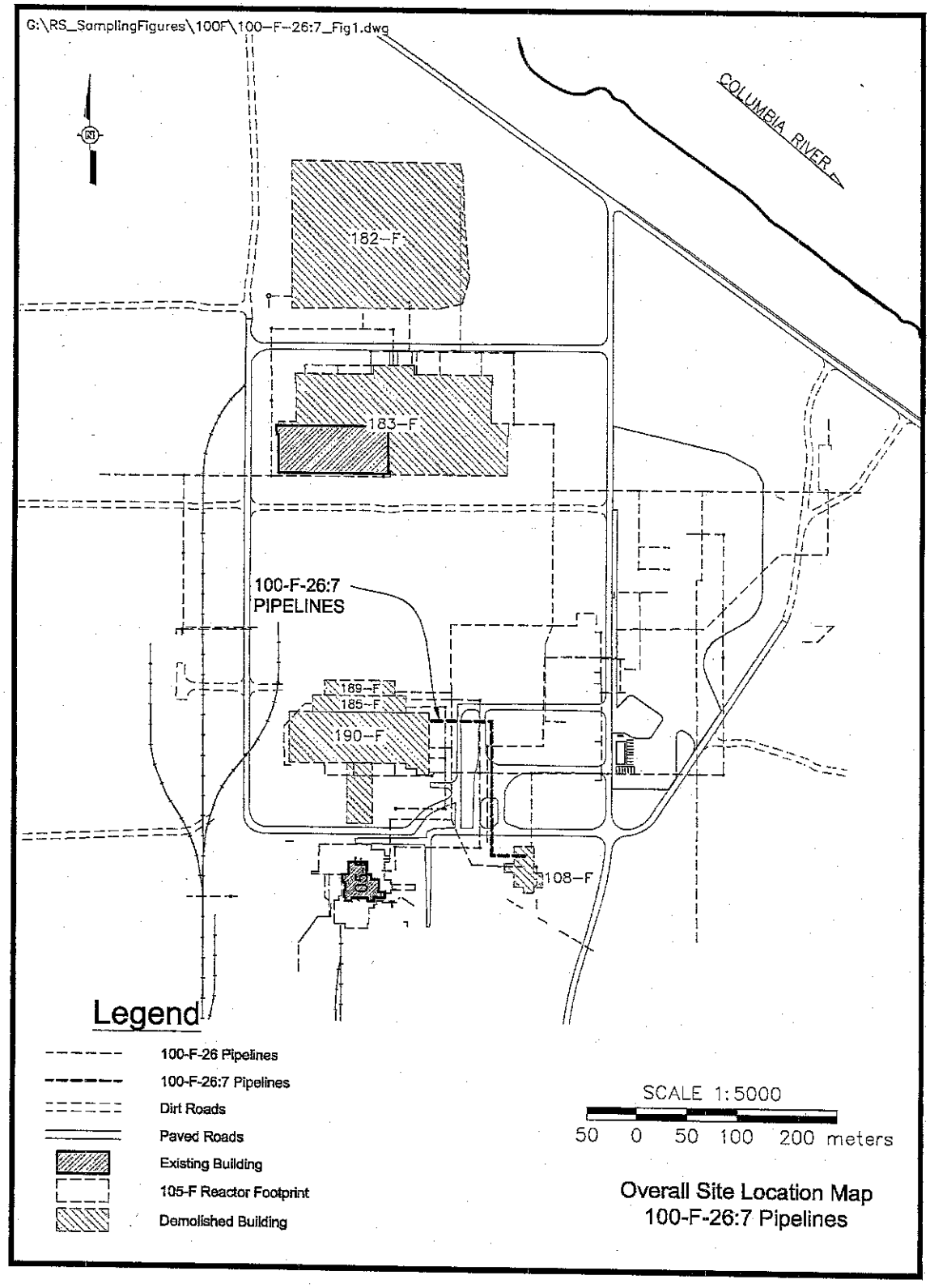
Contaminants of potential concern (COPCs) identified in the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2005a) are cobalt-60, cesium-137, europium-152, europium-154, strontium-90, hexavalent chromium, and metals (inductively coupled plasma [ICP] metals and mercury). In addition to these COPCs, the soil and pipe materials were sampled and analyzed for gamma emitters (gamma energy analysis), gross alpha, and gross beta. Provisions were made in the work instruction for the 100-F-26:7 site (BHI 2004b) to include samples and analysis for asbestos if suspected asbestos-containing material was found during sampling activities. Provisions were also made for total petroleum hydrocarbons and polyaromatic hydrocarbons if stained soil was encountered and for volatile organic analysis if volatile organic compounds had been detected during sampling.

Confirmatory Sample Design

A focused sampling approach was selected for this site, biased towards a worst-case sample location. Pursuant to the approved sample design, process knowledge, historical information, and field observations were used to identify the locations in order to collect samples of the pipe scale and underlying soil at the 100-F-26:7 site location with the greatest potential for residual contamination. In accordance with the focused sampling approach and *Washington Administrative Code* (WAC) 173-340-740(7)(d)(iii), direct comparison of the sample results with the remedial action goals (RAGs) is an acceptable method for evaluating compliance with cleanup objectives at the 100-F-26:7 site.

A focused sampling approach was selected for this site; therefore, WAC-173-340-740(7)(e), which is a requirement for statistically based soil cleanup assessments, is not applicable.

Figure 1. 100-F-26:7 Site Location Map.



The sampling approach consisted of collecting one soil sample directly beneath the sodium dichromate pipeline (BHI 2004b) at a location where it makes a 90-degree bend. The sample location is shown in Figure 2. An additional sample was to be taken of any sediment or scale present inside the pipeline. Alternatively, a sample of the pipe material was to be taken should no scale or sediment be present inside.

The maximum detected results from the soil and pipe samples were used to support site reclassification. Table 1 provides a sample summary.

Confirmatory Sample Results

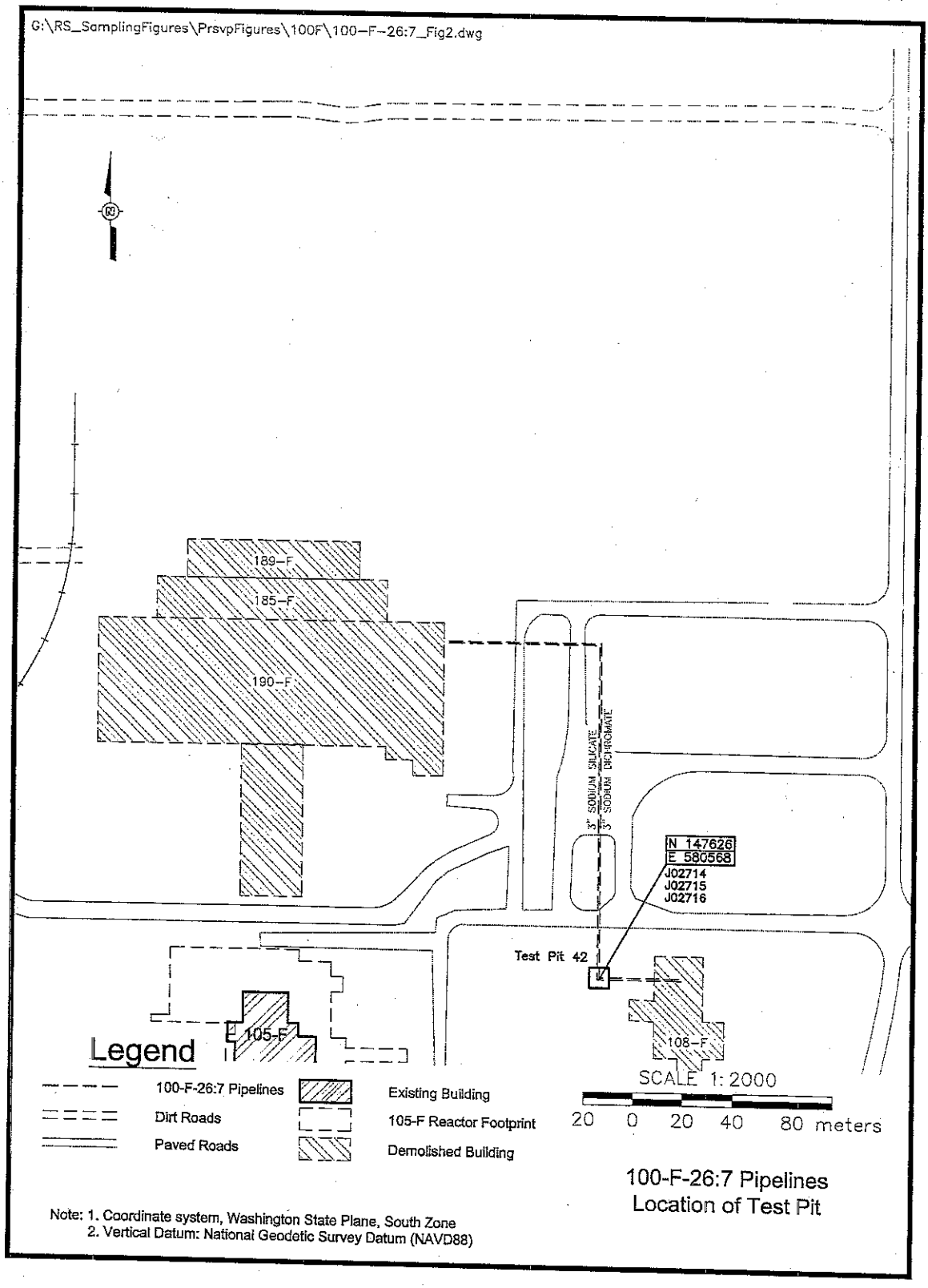
During confirmatory sampling, the sodium dichromate pipeline was first exposed and then opened using the excavator (BHI 2005b). Upon breaking open the pipeline, approximately 11 L (3 gal) of a clear fluid poured out. Radiological and industrial health technicians determined that the fluid was not an immediate health risk, so the sample team proceeded to gather a sample. One soil sample (J02715) and duplicate soil sample (J02716) were taken of soil that had been wetted by the clear fluid that drained from the pipe. Analysis for these samples included all of the COPCs for this site. Because not enough sediment or scale was found inside the pipeline for sampling and analysis, a sample of the pipe itself was broken off and submitted for analysis (J02714). Analysis for this pipe material sample was for hexavalent chromium only due to the low volume of the sample available. An equipment blank sample (J02717) consisting of silica sand was also submitted for laboratory analysis of ICP metals and mercury. An additional equipment blank sample (J025L9) consisting of silica sand was submitted for hexavalent chromium analysis. Table 1 provides a summary of the samples taken at this site and the laboratory analysis performed on each.

Table 1. 100-F-26:7 Sample Summary.

Test Pit	Sample Number	Sample Media	Coordinate Locations	Depth (m bgs)	Sample Analysis
1 (stake no. 42)	J02714	Pipe elbow section	N 147626 E 580568	1.0 m (3.3 ft)	Hexavalent chromium
	J02715	Soil under pipe elbow		1.2 m (4 ft)	ICP metals, hexavalent chromium, mercury, GEA, gross alpha, gross beta
1 (stake no. 42)	J02716 Duplicate of J02715	Soil under pipe elbow	N 147626 E 580568	1.2 m (3.3 ft)	ICP metals, hexavalent chromium, mercury, GEA, gross alpha, gross beta
Equipment blank	J02717	Silica sand	NA	NA	ICP metals, mercury
	J025L9				Hexavalent chromium

bgs = below ground surface
GEA = gamma energy analysis
ICP = inductively coupled plasma
NA = not applicable

Figure 2. Confirmatory Sample Locations at the 100-F-26:7 Site.



The samples were analyzed by offsite contract laboratories using U.S. Environmental Protection Agency-approved analytical methods. After sampling was completed, all of the fixed-based laboratory data were validated to Level C per BHI-EE-01, *Environmental Investigations Procedures*. A data quality assessment (DQA) review was performed to compare the sampling approach and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications. The results of this review are reported in the DQA section. The sample results are stored in the Environmental Restoration project-specific database prior to archiving in the Hanford Environmental Information System and are summarized in the data summary tables (Appendix A).

Review of the notes from the analytical laboratory indicate the pipe material coupon that was submitted for analysis was scraped along its inside surface to produce the sample that was analyzed. Although the field notes state no sediment or scale was visible, this method of sample preparation is equivalent to a sample for which scale or sediment is present. Therefore, the results of this one sample (J02714) will be treated as pipe scale/sediment.

Table 2 compares the maximum detected results for 100-F-26:7 site COPCs with cleanup levels identified in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b). Radionuclides were not identified as COPCs and their absence was confirmed using gamma energy analysis and gross alpha and gross beta analysis (see Appendix A). Of the ICP metals analyzed, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not evaluated in the WAC 173-340-740(3) Cleanup Levels and Risk Calculations table, and thus are not considered COPCs. However, data results for these constituents are presented in Appendix A. Contaminants that were not detected above the practical quantitation limits or minimum detectable activities are excluded from Table 2.

For the soil data evaluation the maximum detected results for all COPCs are less than the applicable RAGs. The clear liquid that poured from the pipe is assumed to be rinse water from decommisioning activities since high levels of contaminants were not detected in the soil that was saturated with the liquid. For the pipe scale/sediment sample, hexavalent chromium was the only COPC to exceed RAGs. To more appropriately use the scale sample results in evaluating whether a pipeline site requires remediation, a calculation (BHI 2005a) was prepared to determine correction factors to be applied to the analytical results. The correction factor is applied to the pipe scale contaminant concentration to provide an effective concentration of the pipe scale that takes into account the pipe material and scale combined. Based on the calculation, the appropriate correction factor for the 7.6-cm (3-in.) steel lines of the 100-F-26:7 sodium dichromate pipeline is 3.8. The resulting concentration is below all RAGs for this compound, and the site is therefore considered uncontaminated.

Table 2. Comparison of Maximum Values to Action Levels for 100-F-26:7 Subsite.

COPC	Maximum Result (mg/kg)		Remedial Action Goals (mg/kg)			Does the Maximum Result Exceed RAGs?		Matrix Results		Does the Maximum Soil and Pipe Result Pass RESRAD Modeling?
	Soil	Pipe Sediment	Direct Exposure	Soil Standard for Groundwater Protection	Soil Standard for River Protection	Soil	Pipe Sediment	Pipe Matrix Value	Does the Matrix Value Exceed RAGs?	
Arsenic	2.4 (<BG)	--	20[a]	20[a]	20[a]	No	No	--	--	--
Barium	69.9 (<BG)	--	5,600[b]	132[e]	--[c]	No	No	--	--	--
Beryllium	0.568 (<BG)	--	10.4[d]	1.51[e]	1.51[e]	No	No	--	--	--
Boron[f]	5.3	--	16,000[b]	320	--[c]	No	No	--	--	--
Chromium, total	9.8 (<BG)	--	120,000[b]	18.5[e]	18.5[e]	No	No	--	--	--
Chromium, hexavalent	0.269	3.2	2.1[d]	4.8	2	No	Yes	0.842	No	--
Cobalt	6.1 (<BG)	--	1,600[b]	32	--[c]	No	No	--	--	--
Copper	12.5 (<BG)	--	2,960[b]	59.2	22[e]	No	No	--	--	--
Lead	5.0 (<BG)	--	353[g]	10.2[e]	10.2[e]	No	No	--	--	--
Manganese	298 (<BG)	--	11,200[b]	512[e]	--[c]	No	No	--	--	--
Mercury	0.07 (<BG)	--	24[b]	0.33[e]	0.33[e]	No	No	--	--	--
Molybdenum	0.473	--	400[b]	8	--[c]	No	No	--	--	--
Nickel	10.2 (<BG)	--	1,600[b]	19.1[e]	27.4	No	No	--	--	--
Vanadium	46.7 (<BG)	--	560[b]	85.1[e]	--[c]	No	No	--	--	--
Zinc	37.7 (<BG)	--	24,000[b]	480	67.8[e]	No	No	--	--	--

[a] The cleanup value of 20 mg/kg has been agreed to by Tri-Party project managers. The basis for 20 mg/kg is provided in Section 2.1.2.1 of the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b).
[b] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), Method B, 1996.
[c] No cleanup level is available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations table, and no toxicity values are available to calculate cleanup levels.
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway; WAC 173-340-750(3), 1996.
[e] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996).
[f] Hanford Site-specific or Washington State background level not available.
[g] A WAC 173-340-740(3) (1996) value for lead is not available. This value is based on the *Guidance Manual for the Integrated Exposure Update Biokinetic Model for Lead in Children* (EPA 1994).
-- = not applicable
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
WAC = *Washington Administrative Code*

Nonradionuclide risk requirements include an individual contaminant hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than $1x10^{-6}$, and a cumulative carcinogenic risk of less than $1x10^{-5}$. For the 100-F-26:7 site, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background. All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detection levels is 4.9×10^{-3}. The individual carcinogenic risk values for the one carcinogenic compound above background level or detection is 4.0×10^{-7}. Therefore, the cumulative carcinogenic risk value for all constituents is 4.0×10^{-7}. Based on the conservative nonradionuclide groundwater and river protection RAGs shown in Table 2, the residual concentrations of the nonradionuclide contaminants are protective of groundwater and the Columbia River. Refer to Appendix B for details of hazard quotient and carcenogenic risk calculations.

DATA QUALITY ASSESSMENT

A DQA review was performed to compare the confirmatory sampling approach and analytical data with the sampling and data requirements specified by the project objectives. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., closeout decisions [EPA 2000]). The assessment review completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data process.

This DQA review was performed in accordance with BHI-EE-01, *Environmental Investigations Procedures*. Specific data quality objectives for the site are found in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2005a). All samples were collected per the sample design. All analyses were performed except for the pipe scale sample. The pipe did not contain enough scale to perform all of the analyses requested in the work instruction (BHI 2004b). The only analysis performed on the scale sample was analysis for hexavalent chromium, which was the main COPC for this site. To ensure quality data sets, the SAP data assurance requirements as well as the validation procedures detailed in BHI-01435 (BHI 2000a) and BHI-01433 (BHI 2000b) for chemical and radiochemical analysis are followed where appropriate.

For this effort several different types of samples have been collected and analyzed. Any one type of sample may present difficulties unique to that type of sample in the various analytical methods used. Therefore, any deficiencies in the resulting data will be commented on here with respect to the type of sample and analytical method used.

Soil Samples

In sample delivery group (SDG) H2953 a soil sample (J02715), its duplicate (J02716), and equipment blank (J02717) were analyzed. The samples analysis consist of metals, inorganics, gross alpha, gross beta, americium, and gamma analysis.

All calibration, check standards, and laboratory control standards were within range. The antimony matrix spike was outside of control limits, and a post-digestion was performed and was within limits. The laboratory and field mercury duplicate samples were outside the relative percent difference (RPD) of 30%, which this is attributed to soil heterogeneity. No issues were found with the inorganic analysis. There are no issues with the rad data. There was no impact on the sample data.

Pipe Scale

In SDG W04493, one sample of pipe scale (J02714) was analyzed for hexavalent chromium. This sample suffered from low sample volume. Consequently, sample matrix spike and duplicate recoveries were not within acceptance limits. The post-digestion matrix spike confirmed matrix effect. There was no impact on the sample data.

Validation

SDG H2953 was validated (BHI 2004a). No major deficiencies were found. Minor issues were found in the metals, wet, and radiochemistry analyses.

Estimate qualifiers (J) were added to all antimony, silicon, and mercury analyses because of matrix spike recovery and relative percent recovery issues. Undetected and estimate qualifiers (UJ) were added to sample J02717 because of blank contamination. In the wet chemistry analyses, no qualifiers were added. All radiochemistry gamma spectroscopy except cobalt-60 were flagged with an estimate qualifier (J) because no laboratory control spike analysis was performed. There was no impact on the sample data.

The DQA review for the 100-F-26:7 site found the results to be accurate within the standard errors associated with the methods, including sampling and sample handling. The DQA review for the 100-F-26:7 site concludes that the data are of the right type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and SDG completeness were assessed to determine if any analytical results should be rejected as a result of quality assurance and quality control deficiencies. All analytical data were found acceptable for decision-making purposes. The confirmatory sample analytical data are stored in the Environmental Restoration project-specific database prior to archiving in the Hanford Environmental Information System and are summarized in Appendix A.

SUMMARY FOR INTERIM CLOSURE

In accordance with this evaluation, the verification sampling results support a WIDS reclassification of the 100-F-26:7 Sodium Dichromate and Sodium Silicate Pipelines site to interim closed out. The analytical results from underlying soil and pipe material samples were shown to meet the cleanup objectives for direct exposure, groundwater protection, and river protection.

REFERENCES

40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations,* as amended.

BHI, 2000a, *Data Validation Procedure for Chemical Analysis*, BHI-01435, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2000b, *Data Validation Procedure for Radiochemical Analysis*, BHI-01433, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2001, *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater*, 0100X-CA-V0038, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2004a, *Final Validation Package SDG W04493, SAF B02-017* Bechtel Hanford, Inc., Richland, Washington.

BHI, 2004b, *Work Instruction for 100-F-26:7 Sodium Dichromate and Sodium Silicate Pipelines*, 0100F-WI-G0030, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

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APPENDIX A

100-F-26:7 SAMPLE DATA TABLES

Table A-1. 100-F-26:7 Radionuclide Data Results.

Sample Location	HEIS Number	Sample Date	Americium-241			Americium-241 GEA			Cesium-137			Cobalt-60			Europium-152			Europium-154		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil	J02715	01/06/05	-0.038	U	0.29	0.3	U	0.3	0.069	U	0.069	0.083	U	0.083	0.19	U	0.19	0.25	U	0.25
Duplicate of J02715	J02716	01/06/05	-0.035	U	0.27	0.24	U	0.24	0.1	U	0.1	0.12	U	0.12	0.23	U	0.23	0.29	U	0.29

Sample Location	HEIS Number	Sample Date	Europium-155			Gross alpha			Gross beta			Potassium-40			Radium-226			Radium-228		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil	J02715	01/06/05	0.19	U	0.19	8.57		3.4	14.6		5.3	8.6		0.92	0.444		0.15	0.498		0.3
Duplicate of J02715	J02716	01/06/05	0.22	U	0.22	10.2		4	16		5.5	12.9		0.94	0.357		0.18	0.918		0.38

Sample Location	HEIS Number	Sample Date	Thorium-228 GEA			Thorium-232 GEA			Uranium-235 GEA			Uranium-238 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil	J02715	01/06/05	0.439		0.086	0.498		0.3	0.26	U	0.26	8.8	U	8.8
Duplicate of J02715	J02716	01/06/05	0.443		0.11	0.918		0.38	0.32	U	0.32	13	U	13

Acronyms and note apply to all tables in this appendix.
Note: Data qualified with B, C, and/or J, are considered acceptable values.
B = blank contamination (organic constituents)
C = blank contamination (inorganic constituents)
GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
J = estimate
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
U = undetected at reported valve

Table A-2. 100-F-26:7 Inorganic Data Results. (2 Pages)

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J02715	01/06/05	4560		3	0.264	U	0.26	2.4	C	0.25	69.9	C	0.04	0.545		0.009	5.3		0.28
Duplicate of J02715	J02716	01/06/05	5070		2.9	0.26	U	0.26	2.2	C	0.24	60.6	C	0.04	0.568		0.009	5.2		0.28
Equipment Blank	J02717	01/06/05	41.3		2.8	0.255	U	0.25	0.334	C	0.24	1.2	C	0.04	0.009		0.009	0.273	U	0.27
Iron Pipe	J02714	01/06/05																		
Equipment Blank	J025L9	01/06/05																		

Sample Location	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J02715	01/06/05	0.028	U	0.03	2860	C	2.6	8.1		0.08	5.4		0.07	12		0.13	0.208	U	0.21
Duplicate of J02715	J02716	01/06/05	0.028	U	0.03	3160	C	2.6	9.8		0.07	6.1		0.07	12.5		0.13	0.269		0.21
Equipment Blank	J02717	01/06/05	0.027	U	0.03	21.7	C	2.5	0.099		0.07	0.089		0.06	0.127	U	0.13	0.2	U	0.2
Iron Pipe	J02714	01/06/05																3.2		2.92
Equipment Blank	J025L9	01/06/05																0.35	U	0.35

Sample Location	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J02715	01/06/05	16500		2.6	4.8		0.21	3190	C	0.65	267		0.03	0.07		0.02	0.473		0.22
Duplicate of J02715	J02716	01/06/05	18900		2.6	5		0.2	3590	C	0.64	298		0.03	0.016		0.02	0.346		0.21
Equipment Blank	J02717	01/06/05	93.4		2.5	0.724		0.2	7.5	C	0.63	2.7		0.03	0.016	U	0.02	0.209	U	0.21
Iron Pipe	J02714	01/06/05																		
Equipment Blank	J025L9	01/06/05																		

Table A-2. 100-F-26:7 Inorganic Data Results. (2 Pages)

Sample Location	HEIS Number	Sample Date	Nickel			Potassium			Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J02715	01/06/05	8.9		0.11	866	C	1.8	0.349	U	0.35	221		1.3	0.094	U	0.09	888	C	0.48
Duplicate of J02715	J02716	01/06/05	10.2		0.11	970	C	1.8	0.344	U	0.34	192		1.3	0.093	U	0.09	855	C	0.47
Equipment Blank	J02717	01/06/05	0.146		0.11	18.8	C	1.7	0.336	U	0.34	32.8		1.3	0.091	U	0.09	8.1	C	0.46
Iron Pipe	J02714	01/06/05																		
Equipment Blank	J025L9	01/06/05																		

Sample Location	HEIS Number	Sample Date	Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J02715	01/06/05	40.6		0.07	33.8		0.12
Duplicate of J02715	J02716	01/06/05	46.7		0.07	37.7		0.12
Equipment Blank	J02717	01/06/05	0.117		0.06	1.1		0.12
Iron Pipe	J02714	01/06/05						
Equipment Blank	J025L9	01/06/05						

APPENDIX B

100-F-26:7 HAZARD QUOTIENT CALCULATION BRIEF

CALCULATION COVER SHEET

Project Title 100-F Area Remaining Sites **Job No.** 22192
Area 100-F
Discipline Environmental ***Calc. No.** 0100F-CA-V0231
Subject 100-F-26:7 Hazard Quotient and Carcinogenic Risk Calculation
Computer Program Excel **Program No.** Excel 97

The attached calculations have been generated to document compliance with established cleanup levels. These documents should be used in conjunction with other relevant documents in the administrative record.

Committed Calculation ☒ **Preliminary** ☐ **Superseded** ☐ **Voided** ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Summary = 3 Total = 4	W. K. Hudson 3/23/05	K. E. Cook 3/24/05	E. T. Feist 3/24/05	R. A. Carlson KEC FOR RAC 3/28/05	

SUMMARY OF REVISION

*Obtain Calc. No. from DIS

DE01437.03 (12/09/2004)

Bechtel Hanford, Inc. CALCULATION SHEET

Originator:	W. K. Hudson	Date:	03/22/05	Calc. No.:	0100F-CA-V0231	Rev.:	0
Project:	100-F Area Remaining Sites	Job No:	22192	Checked:	K. E. Cook KEC	Date:	3/24/05
Subject:	100-F-26:7 Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	1 of 3

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and carcinogenic (excess cancer) risk for the 100-F-26:7 Partial Remaining Sites Verification Package. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2005), the following criteria must be met:

1) An HQ of <1.0 for all individual noncarcinogens
2) A cumulative HQ of <1.0 for noncarcinogens
3) An excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.

GIVEN/REFERENCES:

1) BHI, 2004, *Pipe and Contamination Matrix Reduction Calculations*, 0100B-CA-V0209, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

2) BHI, 2005, Waste Site Reclassification Form 2005-010 and attachment *Remaining Sites Verification Package for the 100-F-26:7 Sodium Dichromate and Sodium Silicate Pipelines*, Bechtel Hanford, Inc., Richland, Washington.

3) DOE-RL, 2005, *Remedial Design Report/Remedial Action Work Plan for the 100 Areas*, DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

4) WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, 1996.

SOLUTION:

1) Generate an HQ for each noncarcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the individual HQ of <1.0 (DOE-RL 2005).

2) Sum the HQs and compare this value to the cumulative HQ of <1.0.

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the excess cancer risk of $<1 \times 10^{-6}$ (DOE-RL 2005).

4) Sum the excess cancer risk value(s) and compare it to the cumulative cancer risk of $<1 \times 10^{-5}$.

Bechtel Hanford, Inc. CALCULATION SHEET

Originator:	W. K. Hudson	Date:	03/22/05	Calc. No.:	0100F-CA-V0231	Rev.:	0
Project:	100-F Area Remaining Sites	Job No:	22192	Checked:	K. E. Cook	Date:	3/23/05
Subject:	100-F-26:7 Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	2 of 3

METHODOLOGY:

Hazard quotient and carcinogenic risk calculations were completed using the data from Table 2 (BHI 2005). Of the contaminants of concern listed on Table 2, boron, molybdenum, and hexavalent chromium require the HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. An example of the HQ and risk calculations are presented below:

1) For example, the maximum value for boron is 5.3 mg/kg, divided by the noncarcinogenic RAG value of 16,000 mg/kg (boron is identified as a noncarcinogen in WAC 173-340-740[3]), is 3.3×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criteria is met.

2) After the HQ calculation is completed for the selected analytes, the cumulative HQ can be obtained by summing the individual values. The sum of the HQ values is 4.9×10^{-3}. Comparing this value to the requirement of <1.0, this criteria is met.

3) To calculate the excess cancer risk, the maximum value is divided by the carcinogenic RAG value, then multiplied by 0.000001. For example, the maximum value for hexavalent chromium is 0.842 mg/kg divided by 2.1 mg/kg, multiplied as indicated is 4.0×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-6}$, this criteria is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk can be obtained by summing the individual values. The sum of the excess cancer risk values is 4.0×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criteria is met.

RESULTS:

1) List individual noncarcinogens and corresponding HQs >1.0: None
2) List the cumulative noncarcinogenic HQ >1.0: None
3) List individual carcinogens and corresponding excess cancer risk $>1 \times 10^{-6}$: None
4) List the cumulative excess cancer risk for carcinogens $>1 \times 10^{-5}$: None.

Table 1 shows the results of the calculations.

Bechtel Hanford, Inc. CALCULATION SHEET

Originator:	W. K. Hudson	Date:	03/22/05	Calc. No.:	0100F-CA-V0231	Rev.:	0
Project:	100-F Area Remaining Sites	Job No:	22192	Checked:	K. E. Cook KEC	Date:	3/22/05
Subject:	100-F-26:7 Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	3 of 3

Table 1. Hazard Quotient and Excess Cancer Risk Results for 100-F-26:7

Contaminants of Concern[a]	Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	5.3	16,000	3.3E-04	--	--
Chromium, hexavalent[c]	0.842	240	3.5E-03	2.1	4.0E-07
Molybdenum	0.43	400	1.1E-03	--	--
Totals					
Cumulative Hazard Quotient:			**4.9E-03**		
Cumulative Excess Cancer Risk:					**4.0E-07**

Notes:
RAG = remedial action goal
-- = not applicable
[a] = From Table 2 (BHI 2005).
[b] = Value obtained from *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.
[c] = Value for the carcinogen RAG calculated based on the inhalation exposure pathway (WAC) 173-340-750(3), 1996.

CONCLUSION:

This calculation demonstrates that the 100-F-26:7 site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2005).